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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/774,885
Filing Date: February 09, 2004
Appellant(s): BERGER ET AL.

MAILED

AUG 0 3 2007

Technology Center 2100

Himanshu S. Amin

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 07, 2007, appealing from the Office action mailed February 26, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

20050138001	**Mittal**	**12-2003**
5,926,820	**Agrawal**	**2-1997**
6,775,682	**Ballamkonda**	**2-2002**

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-25 and 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mittal (US Patent Application No. 20050138001) provisional filed December 23, 2003, in view of Agrawal (US Patent No. 5,926,820) filed February 27, 1997, and further in view of Ballamkonda (US Patent No. 6,775,682) filed February 26, 2002.

Regarding Claims 1,9,10,and 14, Mittal discloses a distinct count query system implemented on a machine comprising:

a query process component ([0047], lines 1-10, Mittal) to retrieve a plurality of partitions from a database (Fig.4; [0058], lines 1-22, Mittal)[1]. However, Mittal is silent with respect to a range component that determines the maximum and minimum values associated with each partition. On the other hand, Agrawal discloses a range component that determines the maximum and minimum values associated with each partition (columns 6-7, lines 60-67 and 1-17, respectively, Agrawal). Mittal and Agrawal are analogous art because they are from the same field of endeavor of efficiently performing a distinct count metric. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Agrawal's teachings into the Mittal system. A skilled artisan would have been motivated to combine as suggested by Agrawal at column 3, lines 36-43, in order to allow queries which specify ranges over multiple dimensions to be processed quickly in the average case. As well as to allow each dimension to

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[1] Examiner Notes: "Dimensions" corresponds with partitions.

have a space overhead which is linear in the number of data points. However, the combination of Mittal in view of Agrawal are silent with respect to a group component that utilizes the maximum and minimum range values to determine independent partitions or partition groups, wherein independent partitions or partition groups are executed concurrently with other partitions. On the other hand, Ballamkonda discloses a group component that utilizes the maximum and minimum range values to determine independent partitions or partition groups (column 10, lines 46-51, Ballamkonda), wherein independent partitions or partition groups are executed concurrently with other partitions (column 10, lines 10-28, Ballamkonda)[2]. The combination of Mittal in view of Agrawal, and further in view of Ballamkonda are analogous art because they are from the same field of endeavor of efficiently evaluating database queries including distinct aggregates. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Ballamkonda's teachings into the Mittal in view of Agrawal system. A skilled artisan would have been motivated to combine as suggested by Ballamkonda at column 4, lines 32-41, in order to have fewer data records to sort and from which to eliminate duplicates, resulting in a more proficient database system.

[2] Examiner Notes: "Parallel" corresponds with concurrent.

Regarding Claim 2, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the database is an OLAP database (column 3, lines 45-51, Agrawal).

Regarding Claim 3, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system further comprising a buffer component to facilitate execution of the distinct count query on sections of the partitions (column 7, lines 8-18, Ballamkonda).

Regarding Claims 4 and 15, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the partitions contain one or more numeric identifiers (Fig.5; [0061], lines 1-16, Mittal).

Regarding Claims 5,12,16,and 17, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the numeric identifiers are ordered in ascending order from smallest to largest value (Fig.5, Mittal).

Regarding Claim 6, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the numeric identifier is a customer ID (Fig.3; [0035], lines 1-18, Mittal).

Regarding Claim 7, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the numeric identifier is a product ID (Fig.3; [0035], lines 1-18, Mittal).

Regarding Claims 8 and 20, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein partitions with overlapping ranges are executed in parallel (column 4, lines 32-46, Agrawal).

Regarding Claims 11 and 19, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the independent partition groups have a non-overlapping range with respect to other partitions (columns 7-8, lines 50-67 and 1-10, respectively, Agrawal)[3].

Regarding Claim 13, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the system wherein the database is a multidimensional database ([0020], lines 1-4, Mittal).

Regarding Claim 18, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method wherein the ranges are determined by retrieving the first and last values from each partition (columns 6-7, lines 60-67 and 1-17, respectively, Agrawal).

Regarding Claim 21, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose a tangible computer readable medium having stored thereon computer executable instructions for carrying out the method ([0044], lines 1-12, Mittal).

Regarding Claims 22 and 23, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose a machine implemented method for executing a distinct count query on a database comprising:

pre-aggregating database data (Fig.4; [0058], lines 1-22, Mittal)[4];

determining a minimum and maximum range of a plurality of data partitions (columns 6-7, lines 60-67 and 1-17, respectively, Agrawal);

identifying independent partition groups to be executed simultaneously with other queried partitions (column 10, lines 10-28, Ballamkonda), the independent partition groups including one or more partitions with a non-overlapping range with respect to other queried partitions (columns 7-8, lines 50-67 and 1-10, respectively, Agrawal).

Regarding Claim 24, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method wherein data is separated

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[3] Examiner Notes: Any of the partitions with ranges that are not intersecting is considered to be non-overlapping.
[4] Examiner Notes: Applicant has disclosed "pre-aggregating" to include partitioning and ordering data. Therefore, "dimensions" correspond to the partitions and Fig.4 show the dimensions in an ordered state.

automatically based on heuristics associated with the database (column 9, lines 45-67, Ballamkonda).

Regarding Claim 25, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method wherein pre-aggregating database data comprises ordering partition data (Fig.5, Mittal).

Regarding Claim 27, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method wherein pre-aggregating database data comprises eliminating redundant data in each partition (column 10, lines 29-45, Ballamkonda).

Regarding Claim 28, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method wherein the other queried partitions include overlapping ranges, which are executed synchronously and in parallel (column 4, lines 32-46, Agrawal).

Regarding Claim 29, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method further comprising executing the distinct count query on sections of partitions utilizing a buffer (column 7, lines 8-18, Ballamkonda).

Regarding Claim 30, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose the method the database is an OLAP database (column 3, lines 45-51, Agrawal).

Regarding Claim 31, the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, disclose a tangible computer readable medium having stored thereon computer executable instructions for carrying out the method ([0044], lines 1-12, Mittal).

(10) Response to Argument

<u>**Definition of range**</u>:

"<u>Microsoft Computer Dictionary</u>", 5th Edition, Published 2002: the spread between specified low and high values.

"<u>The Authoritative Dictionary of IEEE Standards Terms</u>", 7th Edition, Published 2000: The difference between the highest and lowest value that a quantity or function may assume.

Appellant argues Agrawal is completely silent regarding "a range component that determines the maximum and minimum values associated with each partition to determine independent partitions".

Examiner respectfully disagrees. To begin, in response to appellant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which appellant relies (i.e., to determine independent partitions) are not recited in the rejected claim(s) as such. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Specifically, appellants argument as stated above is improper, as can be seen on the last submitted version of the claims (dated 02/05/2007). The second limitation of the claim discusses a

range component that determines minimum and maximum values associated with each partition, which <u>is not</u> implemented in order to <u>determine independent partitions</u>. As a matter of fact, the feature of determining independent partitions are not claimed until the last limitation within the claim language in which a group component is utilized and the group component has the option of determining independent partitions <u>or</u> group partitions (further details discussed below). Next, Agrawal discloses at columns 6-7, lines 60-67 and 1-17, respectively; wherein "*Starting at step 10 of FIG. 1, the data cube is partitioned into a multi-level structure of d-dimensional blocks. Intuitively, a block at level n includes multiple smaller blocks at the next lower level n+1, and so on…At step 12, the blocks are represented as a multiple-level data structure, such as a hierarchical tree structure…The nodes at a level n of the tree correspond respectively to the blocks at level n of the data cube. A simple data cube, its blocks, and the tree representing the blocks are illustrated in FIGS. 2-4, which will be described below. In step 14, for each d-dimensional block, the index of the cell with the maximum value (or minimum value, for a range-minimum query) is determined. The index determined for each block is stored into the node corresponding to this block, in step 16. The range max/min result is then generated in step 18, from the values of the cells selected from those in the query region Q and the cells referenced by the indexes stored at the nodes corresponding to the cells in the region Q*". As seen from the range definitions above, whether a range-maximum result or range-minimum result is determined, does not negate the fact that both a maximum and minimum value is going to be associated with each block (i.e., partition), since a range itself is composed of high and low values. Therefore, within the citation above, the data cube being partitioned into d-dimensional blocks, represent the partitions and for each of the d-dimensional blocks an index of a range max/min result being generated represents the range component with the maximum and minimum values. However, for a further explanation, Agrawal discusses

the limitations of the range at column 9, lines 25-60; wherein "*As an example, consider a query input range (l:h), where l and h are the range lower and upper bounds, respectively. The size of the range is thus given by r=h-l+1...Table 1 below shows an example of an array A, and reference arrays R and L, with the number of elements in each array being n=10.*

TABLE 1

Index i 0 1 2 3 4 5 6 7 8 9

A 4 2 8 6 9 4 7 3 6 5

R 2 2 4 4 10 6 10 8 10 10

L -1 0 -1 2 -1 4 4 6 6 8

The process for finding the index of the maximum value in the range (l: h) is illustrated in the following pseudo-code.

```
max_index = l;
while (R[max_index] <= h)
    max_index = R[max_index];
return (max_index)
```

". The query input range has associate range lower and upper bounds, which is used for arrays with an index of numbers. Also, Table 1 along with the pseudo-code provides examples of the range component. As a result, the above-argued feature is in fact taught by the Agrawal reference.

Appellant argues, Ballamkonda does not teach, "a group component that utilizes the maximum and minimum range values to determining independent partitions or partition groups, wherein independent partitions or partitions groups are executed concurrently with other partitions".

Examiner respectfully disagrees. In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Specifically, appellants arguments that Ballamkonda does not disclose utilizing the maximum and minimum range values are unjust on the grounds that the combination of Mittal in view of Agrawal, and further in view of Ballamkonda, are used to disclose the features argued. Therefore, the maximum and minimum values disclosed by the Agrawal reference are used for the utilization of the maximum and minimum range values. Next, Ballamkonda discloses at column 10, lines 10-51; wherein "*Parallel evaluation of a rollup grouping with distinct aggregates can occur in three stages. At stage 1, the fact table and the associated dimension tables are scanned, joined, sorted, and elimination of duplicate records is performed on the base tables specified in the query so that less data is forwarded to stage 2. Partitioning, which is a mechanism for sending rows of data from one stage to the next stage, is implemented for computational efficiency. To obtain efficient parallelization, in one embodiment, the values associated with the measure of an aggregate function (sometimes referred to herein as the argument) are included as a partitioning key...In one embodiment, the aggregate measure partitioning occurring between stages 1 and 2 is a hash partitioning. Other embodiments utilize range partitioning. This type of partitioning results in even better computational load balancing than does solely*

assigning rows based on the aggregate computation to the slaves...With parallelization, the results obtained from each slave at stage 2 are partial and are subsequently combined with the results from the other stage 2 slaves. At stage 3, collecting and combining the results from each stage 2 slave completes the aggregation...In one embodiment, partitioning that occurs between stages 2 and 3 is on grouping keys and can utilize a hash or range partitioning. In one embodiment, partitioning that occurs between stages 2 and 3 is on a grouping identifier that uniquely identifies the groupings produced by the rollup operator. In another embodiment, partitioning that occurs between stages 2 and 3 is on grouping keys and a grouping identifier". The partitions between stages 2 and 3 being on grouping keys and utilizing range partitioning represent the limitation of a group component with range values to determine partition groups. Also, the parallel evaluation (which is an efficient form of information processing that emphasizes the exploitation of concurrent events in the computing process. Concurrency implies parallelism) of the rollup grouping occurring with the partitions corresponds to the concurrent execution of the partitions. As a result, the above-argued features are in fact by the references as stated above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

An Appeal Conference was held on June 12, 2007 with conferees:

Chelcie Daye (Patent Examiner), Apu Mofiz (SPE), and John Cottingham (SPE)

Respectfully submitted,

CLD

July 26, 2007

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